

SYSTEMS AND METHODS FOR TREATING SUPERFICIAL VENOUS MALFORMATIONS LIKE SPIDER VEINS

RELATED APPLICATION

[0001] This application is a continuation-in-part of co-pending U.S. patent application Ser. No. 11/446,800, filed Jun. 5, 2006 and entitled "Systems and Methods for Treating Superficial Venous Malformations Like Spider Veins," which claims the benefit of U.S. Provisional Patent Application Ser. No. 60/796,656, filed May 2, 2006, and entitled "Systems and Methods for Treating Superficial Venous Malformations Like Spider Veins," which are both incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] As the large group of so-called baby-boomers advances in age, there are increasing demands for effective, non-invasive treatment of vascular diseases or dysfunctions affecting the vascular system. There are also increasing demands for non-invasive cosmetic surgery to repair conditions that have vascular origins.

[0003] For example, spider veins result from various dysfunctions in the veins. Veins carry oxygen-poor blood from the body back to the heart.

[0004] Spider veins can be caused by the backup of blood, when one-way flap valves in veins become weak, causing blood to collect in veins. Spider veins can also arise due to other causes, e.g., hormone changes, inherited factors, and exposure to the sun. Spider veins are often red or blue and close to the surface of the skin. They can look like tree branches or spider webs with their short jagged lines. Spider veins can be found on the legs and face. They can cover either a very small or very large area of skin.

[0005] Sclerotherapy is a common treatment for spider veins. Sclerotherapy involves the injection of a solution into the vein that causes the vein walls to swell, stick together, and seal shut. This stops the flow of blood and the vein turns into scar tissue. Microsclerotherapy uses special solutions and injection techniques that can increase the success rate for removal of smaller spider veins. Sclerotherapy involves tedious, hard to learn injection techniques. It can lead to side effects like stinging or painful cramps where the injection was made, or temporary red raised patches of skin, or skin sores, or bruises. The treated vein can also become inflamed or develop lumps of clotted blood. Applying heat and taking aspirin or antibiotics can relieve inflammation. Lumps of coagulated blood can be drained.

[0006] Laser surgery can be used to treat larger spider veins in the legs. Laser surgery sends very strong bursts of light onto the vein, which makes the vein slowly fade and disappear. Laser surgery is more appealing to some patients because it does not use needles or incisions. Still, when the laser hits the skin, the patient can feel a heat sensation that can be quite painful. Laser surgery can cause redness or swelling of the skin, and can cause burns and scars. Depending on the severity of the veins, two to five treatments (15 to 20 minutes each) are generally needed to remove spider veins in the legs. Moreover, for spider veins larger than 3 mm, laser therapy is not very practical. Furthermore, the capital cost for purchasing trans-dermal lasers can be quite high, making the treatment relatively costly.

[0007] There is need for devices, systems, methods, and protocols that provide minimally invasive, cost effective, and patient-friendly surgical and/or cosmetic surgical treatment of superficial venous malformations, such as e.g., in the treatment of spider veins. There is also a need for devices, systems, methods, and protocols that provide minimally invasive, cost effective, and patient-friendly treatment of diseases or dysfunctions in any region of the body that can be readily accessed by treatment agents carried by blood; e.g., cancers like breast and prostate cancer; ear, nose, and throat conditions; periodontal disease; and diseases of the eye.

SUMMARY OF THE INVENTION

[0008] The invention provides devices, systems, methods, and protocols that provide minimally invasive, cost effective, and patient-friendly surgical and/or cosmetic surgical treatment of superficial venous malformations, e.g., spider veins.

[0009] The invention also provides devices, systems, methods, and protocols that provide minimally invasive, cost effective, and patient-friendly surgical treatment of diseases or dysfunctions in regions of the body that can be readily accessed by treatment agents carried by blood; e.g., cancers like breast and prostate cancer; ear, nose, and throat conditions; periodontal disease; and diseases of the eye.

[0010] According to one aspect of the invention, the devices, systems and methods distribute a reactive agent at, in, or near an inner wall of a vein. The reactive agent is characterized in that it can be controllably activated by the application of a prescribed form of energy. The devices, systems, and methods activate the reactive agent by applying the prescribed form of energy to activate the reactive agent. The activation of the agent causes localized injury to the inner wall of the vein. The prescribed form of energy can comprise, e.g., electromagnetic radiation, and, more particularly, light energy.

[0011] According to another aspect of the invention, the devices, systems, and methods distribute a light-reactive agent at, in, or near an inner wall of a vein. The devices, systems, and methods activate the light-reactive agent by applying light energy at a wavelength that activates the light-reactive agent to cause localized injury to the inner wall of the vein. The light energy is desirably non-thermal and is generated by a low voltage photoactivation device, comprising, e.g., one or more light-emitting diodes. In one embodiment, the light-reactive agent comprises LS11 (Talaporphin Sodium) that is administered intravenously. In another embodiment, the light-reactive agent comprises verteporphin that is administered intravenously. Devices, systems, and methods that incorporate this aspect of the invention can treat superficial venous disease, like spider veins.

[0012] The devices, systems, and methods improve the quality of patient care. The devices, systems, and methods eliminate side effects such as bruising, burning, and skin discoloration. The devices, systems, and methods do not require tedious, hard to learn injection techniques. They do not require high cost trans-dermal lasers. The devices, systems, and method are usable by a large group of practitioners, such as dermatologists, phlebologists, vascular surgeons, and interventional radiologists.